

CLAIMS

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1. A monoclonal antibody capable of binding to a protein which is specifically recognized by the monoclonal antibody produced by the hybridoma deposited at the Deutsche Sammlung von Microorganismen und Zellkulturen GmbH under the accession number DSM ACC2583 or a fragment thereof.
 - 10 2. A hybridoma cell line deposited at the Deutsche Sammlung von Microorganismen und Zellkulturen GmbH under the accession number DSM ACC2583.
 - 15 3. A monoclonal antibody according to claim 1 or a fragment thereof binding to the extracellular I-domain of the integrin $\alpha 10\beta 1$.
 4. A monoclonal antibody according to claim 1 or a fragment thereof binding to the extracellular I-domain of the integrin $\alpha 10\beta 1$ produced by the hybridoma cell line according to claim 2.
 - 20 5. A method for isolating a population of mammalian mesenchymal stem cells, the method comprising the steps of
 - 25 a) providing a cell suspension comprising mammalian mesenchymal stem cells,
 - b) contacting the cell suspension in a) with a monoclonal antibody or a fragment thereof binding to the extracellular I-domain of integrin $\alpha 10\beta 1$, under conditions wherein said monoclonal antibody or a fragment thereof forms an antibody-antigen complex with the extracellular domain of integrin
 - 30 $\alpha 10\beta 1$,
 - c) separating cells binding to the monoclonal antibody or a fragment thereof in b), and optionally
 - d) recovering cells binding to the monoclonal antibody or a fragment thereof in c) from said antibody or a fragment thereof,
 - 35 thereby producing a population of mammalian mesenchymal stem cells, optionally free from said antibody or a fragment thereof.
 6. A method for isolating a population of mammalian chondrocytes, the method comprising the steps of

- a) providing a cell suspension comprising chondrocytes,
 - b) contacting the cell suspension in a) with a monoclonal antibody or a fragment thereof binding to the extracellular domain of integrin $\alpha 10\beta 1$, under conditions wherein said monoclonal antibody or a fragment thereof forms an antibody-antigen complex with the extracellular I-domain of integrin $\alpha 10\beta 1$,
 - c) separating cells binding to the monoclonal antibody or a fragment thereof in b), and optionally
 - d) recovering cells binding to the monoclonal antibody or a fragment thereof in c) from said antibody or a fragment thereof,
- thereby producing a population of chondrocytes, optionally free from said antibody or a fragment thereof.
7. A method for isolating a sub-population of mammalian ES cells, the method comprising the steps of
 - a) providing a cell suspension comprising ES cells,
 - b) contacting the cell suspension in a) with a monoclonal antibody or a fragment thereof binding to the extracellular domain of integrin $\alpha 10\beta 1$, under conditions wherein said monoclonal antibody or a fragment thereof forms an antibody-antigen complex with the extracellular I-domain of integrin $\alpha 10\beta 1$,
 - c) separating cells binding to the monoclonal antibody or a fragment thereof in b), and optionally
 - d) recovering cells binding to the monoclonal antibody or a fragment thereof in c) from said antibody or a fragment thereof,thereby producing a population of chondrocytes, optionally free from said antibody or a fragment thereof.
 8. The methods according to any of claims 5-7, wherein the monoclonal antibody or a fragment thereof binding to the extracellular domain of integrin $\alpha 10\beta 1$ is a monoclonal antibody or a fragment thereof binding to the extracellular I-domain of integrin $\alpha 10\beta 1$ produced by the hybridoma cell line according to claim 1.
 9. The methods according to any of claims 5-8, wherein the monoclonal antibody or a fragment thereof is linked to a solid phase.
 10. The methods according to any of claims 5-9, wherein the solid phase are beads.

11. The methods according to any of claims 5-10, wherein the mammalian cells are human cells.
- 5 12. The methods according to claim 5-11, wherein the mammalian cells are murine cells.
13. A population of mammalian mesenchymal stem cells obtainable by the methods according to any of claims 5, and 8-12.
- 10 14. The population of mammalian stem cells according to claim 13, being human mesenchymal stem cells.
- 15 15. The population of mammalian stem cells according to claim 13, being murine mesenchymal stem cells.
16. A population of mammalian chondrocytes obtainable by the methods according to any of claims 6, and 8 -12.
- 20 17. The population of mammalian chondrocytes according to claim 16, being human chondrocytes.
18. The population of mammalian chondrocytes according to claim 16, being murine chondrocytes.
- 25 19. A subpopulation of mammalian ES cells obtainable by the methods according to any of claims 7, and 8 -12.
20. The population of mammalian chondrocytes according to claim 19, being human chondrocytes.
- 30 21. The population of mammalian chondrocytes according to claim 19, being murine chondrocytes.
- 35 22. A method for detecting a mesenchymal stem cell in a sample, the method comprising the steps of
- a) providing a sample cell suspension comprising a mesenchymal stem cell,
 - b) contacting said sample cell suspension with a monoclonal antibody or a fragment thereof binding to the extracellular domain of integrin

- alpha10beta1,
- 5 c) incubating the sample cell suspension and the monoclonal antibody or a fragment thereof under conditions wherein said monoclonal antibody or a fragment thereof forms an antibody-antigen complex with the extracellular domain of integrin alpha10beta1 on a mesenchymal stem cell,
- d) optionally adding a second labelled antibody or a fragment thereof to the sample, wherein the second antibody or a fragment thereof binds to the monoclonal antibody or a fragment thereof in b)
- 10 e) detecting the monoclonal antibody or a fragment thereof bound to the extracellular domain of integrin alpha10beta1 of the sample b), or optionally detecting the second labelled antibody or a fragment thereof in c) bound to the monoclonal antibody or a fragment thereof, thereby detecting the mesenchymal stem cell.
- 15 23. A method for detecting a chondrocyte in a sample, the method comprising the steps of
- a) providing a sample cell suspension comprising a chondrocyte,
- b) contacting said sample cell suspension with a monoclonal antibody or a fragment thereof binding to the extracellular domain of integrin
- 20 alpha10beta1,
- c) incubating the sample cell suspension and the monoclonal antibody or a fragment thereof under conditions wherein said monoclonal antibody or a fragment thereof forms an antibody-antigen complex with the extracellular domain of integrin alpha10beta1 on a chondrocyte,
- 25 d) optionally adding a second labelled antibody or a fragment thereof to the sample, wherein the second antibody or a fragment thereof binds to the monoclonal antibody or a fragment thereof in b)
- e) detecting the monoclonal antibody or a fragment thereof bound to the extracellular domain of integrin alpha10beta1 of the sample b), or
- 30 optionally detecting the second labelled antibody or a fragment thereof in c) bound to the monoclonal antibody or a fragment thereof, thereby detecting the chondrocyte.
24. A method for detecting an ES cell in a sample, the method comprising the steps
- 35 of
- a) providing a sample cell suspension comprising an ES cell,
- b) contacting said sample cell suspension with a monoclonal antibody or a fragment thereof binding to the extracellular domain of integrin alpha10beta1,

- c) incubating the sample cell suspension and the monoclonal antibody or a fragment thereof under conditions wherein said monoclonal antibody or a fragment thereof forms an antibody-antigen complex with the extracellular domain of integrin $\alpha 10\beta 1$ on an ES cell,
- 5 d) optionally adding a second labelled antibody or a fragment thereof to the sample, wherein the second antibody or a fragment thereof binds to the monoclonal antibody or a fragment thereof in b)
- e) detecting the monoclonal antibody or a fragment thereof bound to the extracellular domain of integrin $\alpha 10\beta 1$ of the sample b), or
- 10 optionally detecting the second labelled antibody or a fragment thereof in c) bound to the monoclonal antibody or a fragment thereof thereby detecting the ES cell.

25. A method for blocking the binding of a chondrocyte to an extracellular matrix molecule (ECM), the method comprising the steps of
- 15 a) providing a monoclonal antibody or a fragment thereof binding to the extracellular domain of integrin $\alpha 10\beta 1$,
 - b) contacting said monoclonal antibody with said chondrocyte under conditions wherein said monoclonal antibody or a fragment thereof forms
 - 20 an antibody-antigen complex with the extracellular domain of integrin $\alpha 10\beta 1$
 - c) incubating the antibody-antigen complex in b) above, thereby blocking the binding of a chondrocyte to said ECM molecule.

- 25 26. A method for modulating the signalling of $\alpha 10\beta 1$ on a mammalian mesenchymal stem cell, ES cell or a chondrocyte, the method comprising the steps of
- a) providing a monoclonal antibody or a fragment thereof binding to the extracellular I-domain of integrin $\alpha 10\beta 1$,
 - 30 b) contacting said stem cell or chondrocyte under conditions wherein said monoclonal antibody or a fragment thereof forms an antibody-antigen complex with the extracellular domain of integrin $\alpha 10\beta 1$ on said cells, and
 - c) incubating said antibody-antigen complex,
 - 35 thereby modulating the signalling of $\alpha 10\beta 1$ on a human mesenchymal stem cell, ES cell or a chondrocyte.

27. A method for detecting the expression of integrin $\alpha 10\beta 1$ in a tissue sample or on a cell surface, the method comprising the steps of

- a) providing a tissue sample or a cell,
- b) providing a monoclonal antibody or a fragment thereof binding to the extracellular I-domain of integrin $\alpha 10\beta 1$ in the tissue sample or cell,
- 5 c) incubating the tissue sample or cell and the monoclonal antibody or a fragment thereof under conditions wherein said monoclonal antibody or a fragment thereof forms an antibody-antigen complex with the extracellular domain of integrin $\alpha 10\beta 1$,
- 10 d) optionally adding a second labelled antibody or a fragment thereof to the sample, wherein the second antibody or a fragment thereof binds to the monoclonal antibody or a fragment thereof in b),
- e) detecting the monoclonal antibody or a fragment thereof bound to the extracellular domain of integrin $\alpha 10\beta 1$ of the sample b), or optionally detecting the second labelled antibody or a fragment thereof in
- 15 c) bound to the monoclonal antibody or a fragment thereof.

28. A method for in vivo imaging the expression of the integrin $\alpha 10\beta 1$ in a mammal, the method comprising the steps of

- a) providing a mammal,
 - 20 b) providing an monoclonal antibody or a fragment thereof binding to the extracellular I-domain of integrin $\alpha 10\beta 1$, and wherein said monoclonal antibody or a fragment thereof optionally are conjugated,
 - c) administering the monoclonal antibody or a fragment thereof to the mammal so as to allow the antibody or a fragment thereof to bind to the
 - 25 extracellular I-domain of integrin $\alpha 10\beta 1$ of cells in said mammal,
 - d) optionally adding a second labelled antibody or a fragment thereof to the sample, wherein the second antibody or a fragment thereof binds to the monoclonal antibody or a fragment thereof in c),
 - e) detecting the monoclonal antibody or a fragment thereof bound to the
 - 30 extracellular I-domain of integrin $\alpha 10\beta 1$ of said cells in c), or optionally detecting the second labelled antibody or a fragment thereof in
 - d) bound to the monoclonal antibody or a fragment thereof, and
 - f) creating an image of the detected antibody or a fragment thereof,
- thereby imaging the expression of integrin $\alpha 10\beta 1$ on cells in a mammal in
- 35 vivo.

29. The method according to claim 28, wherein the extracellular I-domain of integrin $\alpha 10\beta 1$ is on a cell in an atherosclerotic plaque in a blood vessel.

30. The methods according to any of claims 22-29, wherein the monoclonal antibody or a fragment thereof binding to the extracellular I-domain of integrin alpha10beta1 is produced by a cell line according to claim 1.
- 5 31. A composition comprising a monoclonal antibody capable of binding to a protein which is specifically recognized by the monoclonal antibody produced by the hybridoma deposited at the Deutsche Sammlung von Microorganismen und Zellkulturen GmbH under the accession number DSM ACC2583 or a fragment thereof.
- 10 32. A composition according to claim 31, comprising a monoclonal antibody or a fragment thereof binding to the extracellular I-domain of integrin alpha10beta1.
- 15 33. The composition according to claim 32, wherein the monoclonal antibody or a fragment thereof binding to the extracellular I-domain of integrin alpha10beta1 is produced by a cell line according to claim 2.
- 20 34. The composition according to any of claims 31-33, wherein the monoclonal antibody or a fragment thereof further comprises a detectable label.
- 25 35. An administration vehicle comprising a monoclonal antibody capable of binding to a protein which is specifically recognized by the monoclonal antibody produced by the hybridoma deposited at the Deutsche Sammlung von Microorganismen und Zellkulturen GmbH under the accession number DSM ACC2583 or a fragment thereof.
- 30 36. An administration vehicle according to claim 35, comprising a monoclonal antibody or a fragment thereof binding to the extracellular I-domain of integrin alpha10beta1, a pharmaceutical acceptable carrier, and a pharmaceutical acceptable drug affecting joint diseases or atherosclerosis.
- 35 37. The administration vehicle according to claim 36, wherein the monoclonal antibody or a fragment thereof binding to the extracellular I-domain of integrin alpha10beta1 is produced by the cell line according to claim 2.
38. Use of a monoclonal antibody or a fragment thereof binding to the extracellular I-domain of integrin alpha10beta1, for the preparation of a pharmaceutical composition for the treatment of musculoskeletal diseases, arthritis or atherosclerosis.

39. The use according to claim 38, wherein the monoclonal antibody or a fragment thereof binding to the extracellular I-domain of integrin alpha10beta1 is produced by the cell line according to claim 2.
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40. Use of a monoclonal antibody or a fragment thereof binding to the extracellular I-domain of integrin alpha10beta1 for the preparation of a pharmaceutical composition for gene therapy treatment of musculoskeletal diseases, arthritis or atherosclerosis.
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41. The use according to claim 40, wherein the monoclonal antibody or a fragment thereof binding to the extracellular I-domain of integrin alpha10beta1 is produced by the cell line according to claim 2.
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42. The use according to claim 41, wherein the pharmaceutical composition comprises an adenovirus for gene therapy treatment of arthritis.
43. A kit comprising a monoclonal antibody capable of binding to a protein which is specifically recognized by the monoclonal antibody produced by the hybridoma deposited at the Deutsche Sammlung von Microorganismen und Zellkulturen GmbH under the accession number DSM ACC2583 or a fragment thereof.
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44. The kit according to claim 43, comprising a monoclonal antibody binding to the extracellular I-domain of integrin alpha10beta1.
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45. The kit according to claim 44, wherein the monoclonal antibody or a fragment thereof binding to the extracellular I-domain of integrin alpha10beta1 is produced by the cell line according to claim 2.
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46. The kit according to any of claims 43-45, wherein the monoclonal antibody or a fragment thereof is bound to a solid phase.
47. The kit according to any of claims 43-46, wherein the monoclonal antibody or a fragment thereof comprises a detectable label.
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48. A kit comprising a hybridoma cell line according to claim 2, and a cell culture medium for said hybridoma cell line.